

Low Temperature, High Energy Density Micro Thin Film Solid Oxide Fuel Cell, Phase I

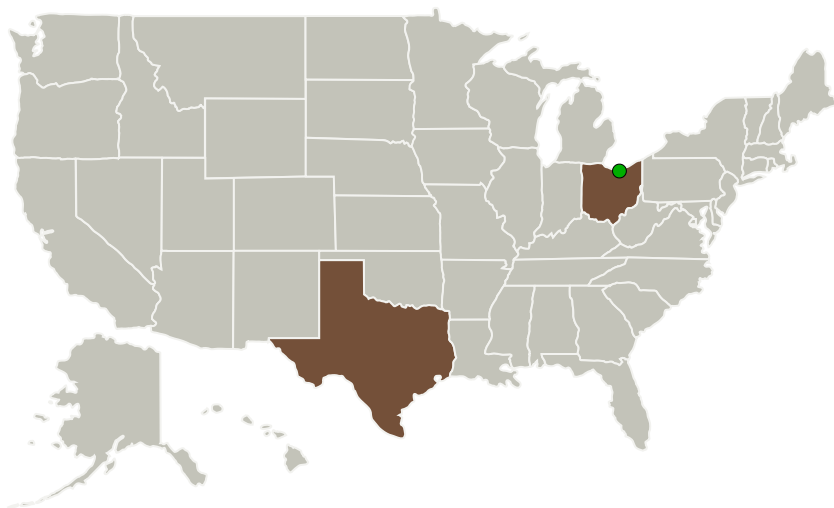
Completed Technology Project (2012 - 2012)



Project Introduction

A new type of solid oxide fuel cell based on thin film technology and ultra-thin electrolyte is being proposed to develop to realize major reductions in fuel cell size, weight, and operating temperature, while significantly increasing power density. The thin film fuel cell is comprised of a micro-thin electrolyte (thickness $\sim 1\mu\text{m}$) that is grown on a foil nickel substrate. The nickel substrate is then made into a porous anode by lithographic patterning and etching of the foil. The SOFC structure is completed by the deposition of a thin-film mixed ionic-electronic conducting oxide cathode on the electrolyte. Preliminary data has shown the thin film fuel cell to have an output of $\sim 100\text{mA}/\text{cm}^2$ at temperatures as low as 500°C – more than 400°C lower than for typical bulk SOFC's. A single cell has a total thickness of 15-20 micron, and the integration of interconnects to the cells to form a stack is projected to result in a cell power density of $> 5\text{W}/\text{cm}^3$ – more than 20x greater than typical SOFC's.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Nano EnerTex	Lead Organization	Industry Women-Owned Small Business (WOSB)	Houston, Texas
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Ohio	Texas
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Project Transitions

**February 2012:** Project Start**August 2012:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138272>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nano EnerTex

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Ali Zomorrodian

Technology Maturity (TRL)

Start: **3**Current: **4**Estimated End: **4**

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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.2 Energy Storage
 - └ TX03.2.2 Electrochemical: Fuel Cells

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System